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ABSTRACT

Assuming that a child uses a "reduced version" of the adult phonological system, as opposed to an "imperfect" version, a phonological analysis of a five-year-old child's language is conducted. Research procedures are thoroughly described; tables and diagrams are included. (DD)

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PHONOLOGICAL PROCEDURES FOR CHILD LANGUAGE

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It has often been stated by linguists (e.g. Haas, 1963) that in making phonological analyses of children's speech it must be emphasized that at all stages of development the child has a system of his own and that it is misleading to regard his speech as "an imperfect version of adult language" (Fry, 1968, p.19). This article suggests that over-emphasizing such viewpoints, particularly with regard to articulatory disorders, may be as unhelpful as the earlier disregard of functional factors (being "swamped by a mass of observations") which such emphasis was intended to dispel.

THE PROCEDURE OF ANALYSIS

Earlier Methodology. It is often implied that undertaking a phonological analysis of a child's speech is like approaching a foreign language; we must therefore use the "normal techniques of phonological analysis" (Haas, 1963, p.240). The suggestion we wish to make in this article is that we should start our analysis with the assumption that the child is using a "reduced version" of the adult phonological system. By this we mean that the child's use of contrasts will partly reflect the adult's use of such contrasts; at the same time a number of contrasts in the adult's system will not be present in the child's speech. We need not expect the child to have more contrasts than

the adult and we can legitimately expect that he will distribute such contrasts as he has in a similar way to the adult model (expect of course that the contrasts he has may also do duty for those which are not present). When we analyse a child's speech we are attempting to find out what contrasts of the adult system are present and what are not, both at the feature level and the phonemic level. This is different from approaching an unknown language where the analyst does not know what contrasts to expect.

If we allow this initial assumption of a "reduced version" it becomes legitimate in undertaking a phonological analysis of a child's language to compare every sound produced by the child with its "target". Indeed comparisons of this sort have often been implicit in such analyses. Statements such as "the latter (occurs) where we would expect h or f" imply this (Haas, 1963, p.242).

Assessment Techniques. There are basically two techniques, at least with very young children, by which we attempt to discover a child's phonological system: firstly by transcription and analysis of data; secondly by presenting pictures designed to elicit the presence or

absence of certain contrasts.*1 Both depend on a prior assumption of a target phonological system. If we were treating the child's language as a completely unknown one, we would be obliged to use the technique of questioning the child in some detail: asking such questions as: "Does this utterance mean the same as that? Is there a word such as ------?" There is nothing illegitimate in proceeding in such a way with child language if the questioner wishes to disregard the fact that the child's phonological system will bear a close relationship to his own. But it seems a) difficult to use such a technique with very young children, b) to introduce a needlessly difficult procedure when the assumption of a "reduced system" will allow a simpler procedure.

We may then start with such an assumption and compare the sounds elicited either in unguided or guided data (i.e. from pictures) with the target system.

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*1 Tests at present in common use by speech therapists do not in practice attempt to do this. They merely attempt to elicit from the child (although by the use of pictures) a series of words in which all the phonemes of adult English occur. They are therefore basically tests of the first sort, but with some control over the data elicited: for example, the Renfrew Articulation Test (published privately, 1964) which is commonly used by speech therapists in Britain; and the Templin-Darley Articulation Tests (1960), frequently used in the United States. The recently published Edinburgh Articulation Test (Anthony, Boyle, Ingram, and McIsaac, 1971), while showing a considerable advance in phonetic sophistication, in its treatment of consonant clusters, and in its standardization, does not appear to incorporate any notion of contrast.

Theoretical Preliminaries. At this point a few comments must be made on the adult system with which we are to compare the child's. In view of current developments in phonological theory a few apologia are required. Firstly we wish to investigate the phonological system as far as possible independently of the grammar of the language: we are therefore using a phonemic level. If this is offensive to some theorists, this phonemic level can be regarded as purely notational, indicating a certain synthesis of phonological features. Secondly the set of distinctive features to be used is obviously open to discussion (c.f. Menyuk, 1968; Morley and Fox 1969). We do not wish to become involved here in such a discussion; we merely assume a number of "natural" classes. We are concerned only marginally with what features are significant and what redundant; therefore not too much significance should be attached to any labels we may use. Nevertheless we have to use some set of features purely for exemplification and we will use a set which is highly redundant since we wish our phonological distinctive features and classes to mirror phonetic reality fairly closely.*2 Thirdly it might be objected that we take no account of the distinctions

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*2 For the use of the terms fortis and lenis in preference to voiceless and voiced, see Gimson (1962) p.32.

between competence and performance and between production and comprehension. In this article we are only involved with some sort of abstraction from a child's performance in speech. A similar abstraction might be made from the child's performance in comprehension. Consideration of both abstractions might lead to an overall statement about competence. Fourthly the question of the "target" dialect is obviously crucial, particularly for vowels (see Higgs, 1970). We shall therefore limit ourselves in this article to consonants, which are less dependent on dialectal variation.

The Present Procedure. As a working procedure for the analysis of defective speech we need some sort of matrix like the chart of the International Phonetic Association which will, by implying cross-classification of phonemes, display the distinctive phonological features of English and on which we can compare the child's sounds*3 with the target. We must state once again that the labels identifying the natural classes are not meant to be in any way definitive (nor indeed are the class divisions themselves).

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*3 The term "realization" (e.g. as used in Beresford and Grady, 1967, 1968) is I think to be avoided. This term is generally used in linguistics to state relationships between various levels of abstraction, not to compare different systems (e.g. it applies to the phoneme/allophone relationship but not to the relationship between dialectal variants).

We transcribed a text of some two hundred words of a boy of five with an articulation disorder. We systematically compared each consonant sound with the target consonant (clusters in the target system present a special problem which will be discussed later; for the moment we are concerned only with single consonants in the target). The assumption has also to be made that the consonant system of the child will be different in word-initial and word-final positions (this of course might be stated as syllable-initial and syllable-final but we deliberately use the former terms to allow us to have the possibility of a word-medial system which may or may not be later explainable in terms of word-initial and word-final). TABLE 1 compares the child's sounds (on the right , with the number of occurrences indicated) with the target phonemes /\ (on the left) in word-initial position only and the remainder of the paper will discuss the implications of the matrix. The sounds produced by the child are given in narrow transcription. A number of detailed notes on the procedure are necessary. Since we are concerned with comparisons in terms of the target it follows that we cannot use in this sort of analysis words which cannot be identified semantically with target words. There were indeed stretches of four or five words which could not be understood and which were therefore ignored. Also of course hesitation phenomena are ignored. Also in this particular text there did not appear to be any distinction

TABLE 1

		Labial		Dental		Alveolar		Palatal		Velar		Glottal	
PLOSIVES (inc. Affricates)	Fortis	p	p^{1}			t	t^{2} $\underset{\sim}{s}^{2}$	$\widehat{t\int}$		k	$\underset{\sim}{s}'$ k''		
	Lenis	b	p' b^{δ}			d	d^{9} k'	$\widehat{d3}$	θ' t' $\underset{\sim}{s}'$	g	g^{13}		
FRICATIVES	Fortis	f	f^{2} $\underset{\sim}{s}'$	θ		s	$\underset{\sim}{s}^{5}$ t^{2} s'	ʃ	$\underset{\sim}{s}^{3}$			h	$\underset{\sim}{s}'$ $2'$
	Lenis	v		ð	ð' d^{7}	z		ʒ					
NASALS		m	m^{9} w'			n	n^{12}			ŋ			
LATERAL						l	ø' j' l^{3}						
APPROXIMANT		w	w^{4} m^{2}			r	v^{7} w^{2}	j	j^{14}				

between a and the and the non-occurrence of any sound corresponding to /ð/ where the might have been expected was therefore discounted.

In spite of such allowances it is nevertheless true that the high frequency of certain words will in turn produce a distortedly high frequency of occurrence of some phonemes - the main cases affecting the above table were yes which accounted for most of the correct occurrences of /j/ and don't know which accounted for a high proportion of the correct /n/'s and /d/'s. This raises the problem of "item-learning" versus "system-learning". The parallel in grammar is the learning of the word came before the regular formation of the past tense in /t/, /d/, or /ɪd/ is learnt; and its subsequent replacement by comed or camed when the regular formation is learnt. In phonology individual items may become fixed in a form which bears little relation to the rest of the system: the word yes mentioned above regularly had [ç] for the final consonant but this sound was limited to this one word. The fact that repeated occurrences of one word may distort the results on a matrix such as the above might argue for a lexical rather than a textual basis. Unfortunately there are sufficient examples of a converse nature - that is where a word is produced differently on different occasions - to indicate a strong counter argument. This problem has been resolved rather

arbitrarily by including all such repeated occurrences.

Certain interesting information is not recorded by this method, such as consonantal variation controlled by following vowels, or interaction between consonants in syllable-initial and syllable-final positions. This simply proves that no one assessment technique will give all relevent information.

Clusters. As noted above the matrix covers only those cases where there was a single consonant in the target; in fact with a child of this age such cases probably cover a higher proportion of words than would be the case in the adult language. Clusters which arose (with the child's productions) were as follows:-

/br/ > [b]'
/bl/ > [p]'
/pl/ > [p]'
/fl/ > [s̪]²
/fr/ > [v]'
/θr/ > [ts]'
/tw/ > [t]'
/sk/ > [k]'

Clusters need to be interpreted in the light of the analysis which has been made of the single consonants. At an early stage in development one of the constituent members of the cluster may be produced, e.g. /fl/ > [f] but later a sort of

feature synthesis or blend may occur, e.g. /fl/ > [s̪] (see Higgs, 1968; Hutcheson, 1968). However, if among the single consonants no distinction exists between /s/ and /f/, we may simply be dealing in such a case with one constituent member erratically produced rather than a blend. In the case above where /fl/ > [s̪]² the single consonant data suggests a blend although of course the data is very limited.

We have then a matrix of the sort above plus an additional note on clusters (in practice we would have a similar statement for word-final and word-medial positions). We have now to consider how such a matrix is to be interpreted.

THE PHONOLOGICAL STATEMENT

The Child's System. While there is obviously some truth in statements to the effect that the child has "a language of his own" (Haas, 1963, p.240) and it was doubtless a useful antidote to extreme phonetic as opposed to phonemic orientation, such statements should not be accepted unthinkingly. The constant repetition of such statements leads one to expect to find in any individual child a system as fixed as the adult's. It is of course true that any human language is never totally fixed, that there are for example edges of a language where analogy is operating. But

if this is true of any adult language, it is even more true of child language. Indeed child language is so unfixed, so constantly changing, that it is doubtful whether the term system is appropriate. However, if one does use the term it is important to stress that it is a system in which some parts are firmly established, other parts erratically so, and yet other parts are only in process of establishment.

In no part of language is this more true than in phonology. The most obvious way in which these degrees of establishment show themselves is in feature and phoneme contrasts.

Fortis v. Lenis. Consider first the contrast fortis v. lenis. We are considering only plosives and fricatives, where the contrast is relevant. We get the following totals from our matrix above:

	Fortis	Lenis
Fortis	34	0
Lenis	5	38

Of thirty-four expected occurrences of a fortis consonant all were correct; of forty-three occurrences of a lenis contrast five were incorrect for this feature. It is apparent that this contrast is fairly well established. It is also perhaps significant (and we will return to this in a moment) that the deviances are all in one direction.

Manner of Articulation. The following are the relevant totals:

	Plosive	Fric.	Nasal	Lateral	Approximant
Plosive	38	5			
Fricative	10	15			
Nasal			21		1
Lateral				3	1
Approximant			2		32

It is again apparent that the contrasts seem fairly well established with the exception of that between plosive and fricative. This contrast is in process of establishment.

Place of Articulation. When we come to consider the various contrasts dependent on the place of articulation various problems arise. They arise firstly from the fact that our phonological classifications of the fortis/lenis*4 and manner of articulation contrasts are also utilizable as a phonetic taxonomy, that is, the classification needed for English is suitable as a general phonetic framework, whereas with place of articulation this is not so (i.e. many more places are phonetically possible, and occur in child language, than are necessary for a phonological, or even phonetic,

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*4 It might be argued that some languages have a three-term set of contrasts under this heading (e.g. Korean) but in practice there is no great difficulty in placing a child's sounds into a two-term set (utilizing of course such phonetic features as aspiration, voicing, and, in final position, length of preceding vowels and continuant consonants).

description of English). Secondly, different classifications of place of articulation are necessary according to what manner feature is occurring (this problem has of course already arisen in a minor way with the fortis/lenis distinction which is phonologically irrelevant with some manner features).

The second of the difficulties may be solved by considering and displaying place contrasts separately in conjunction with each manner feature which is relevant (again as we did with fortis/lenis above, which was only considered with reference to plosives and fricatives). We are hence dealing with a level of abstraction intermediate between the single feature and the phonemic.

The first of the difficulties is more serious. It means that if we wish to set up a table like those above which will indicate the presence or absence of contrasts utilizing place of articulation features (in conjunction with each relevant manner feature) we have to decide where to enter sounds such as [ʔ] [s̪] and, although not in this text, sounds like [ç] [x]. The important point seems to be that provided we allot <u>all</u> occurrences of a sound to that target place of articulation for which it occurs most often, our table will be valid as a measure of contrasts.*5 [s̪], for example, in our text, when it occurred in conjunction with the manner feature plosive,

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*5 Such a procedure will also take care of any correct allophonic variation. The descriptionsin this article are of course based on the most frequent target allophone.

corresponded most often with an alveolar plosive. Therefore in measuring place features, [g] is considered correct when it corresponds with an alveolar plosive, wrong when it corresponds with a velar plosive. This particular text had few non-English sounds, but in larger and more deviant texts the problem will certainly arise with other sounds. A further problem concerns cases where a target consonant is represented by zero in the speech of the child; it seems best to ignore such cases, or perhaps, if there were a very large number of such cases, an extra column might be added.

We can now go ahead and present tables for the present text displaying place of articulation features in conjunction with each relevant manner feature:

a) with plosives

	Bilabial	Alveolar	Palatal	Velar
Bilabial	11	-	-	-
Alveolar	-	13	-	1
Palatal	-	3	-	-
Velar	-	1	-	15

b) with fricatives[*6]

	Labio-dental	Dental	Alveolar	Palatal	Glottal
Labio-dental	2	1	-	-	-
Dental	-	1	7	-	-
Alveolar	-	5	3	-	-
Palatal	-	2	3	-	-
Glottal	-	1	-	-	1

c) with nasals

	Bilabial	Alveolar	Velar
Bilabial	10	-	-
Alveolar	-	12	-
Velar	-	-	-

d) with approximants

	Bilabial	Alveolar	Palatal
Bilabial	11[*7]	-	-
Alveolar	-	9[*8]	-
Palatal	-	-	14

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*6 What feature analysis we use is crucial to the interpretation of [s̪]. We have kept strictly to a place analysis. It was considered correct when occurring for a target dental, incorrect when occurring for a target alveolar (cf. its treatment in combination with plosives mentioned above). We might of course have distinguished such fricatives by the type of aperture, i.e. slit v. groove (/sz/ in English being groove alveolars and /θð/ slit dentals; while [s̪z̪] are groove dentals).

*7 Here the occurrence of [m] for /w/ once is counted as correctly labial even though /w/ itself is strictly speaking labio-velar.

*8 Most of the occurrences of /r/ were [ʋ] which is a good example of how we should treat a non-English sound (if we regard it as non-English!) All (not just the majority of the occurrences of [ʋ] were for /r/ and it is therefore counted as correct. Alternatively, such occurrences may be regarded as correct allophonic variation.

It is obvious that place of articulation among fricatives*9 is poorly established. It is also evident that the palatal plosives (phonetically palato-alveolar affricates) are similarly so. Here of course the type of feature analysis may again be crucial. We have chosen to regard place as a distinctive feature of /tʃ dʒ/ but it could be argued that they were alveolars with slow release. This would involve another manner feature; however this slow release was also absent and therefore we preferred the present less complicated analysis.

Degrees of Establishment. Summing up we may say that some features are firmly established: nasals*10, approximants*10, the place of articulation of plosives (with the exception of the palato-alveolar affricates)*10. Some are less established: fortis v. lenis. Some less still: fricative v. plosive. Finally some virtually not at all: place of articulation among fricatives*10.

In comparing any feature or phoneme contrasts in the target and the child's system we observe various types of correspondence. Firstly there may be complete generalization of one feature thus:

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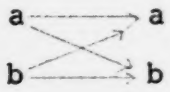
*9 What we actually mean is that the various binary contrasts involving place of articulation among fricatives are poorly established.

*10 Once again this is obviously shorthand for "the contrasts in which nasals are involved"...etc...

1 target child

This is exemplified in the present text by the distinction alveolar v. palato-alveolar when combined with the plosive feature. Secondly, there may be a situation of near complete free variation:

2 target child



The distinction fricative/plosive fits this category. Thirdly, there may be a tendency only to generalize one feature:

3 target child

This is exemplified by the fortis/lenis distinction. At this stage it is possible to argue that the child has some sort of opposition between the two units: one unit occurs in words which only have sound-type a; the other unit occurs in words which have a or b in free variation. Lastly we may have correct correspondence.

4 target child

Such is the nasal/plosive distinction. Some such categorization would seem to be relevant to grading the degree of establishment of distinctions.

The procedures and statements suggested in this article about establishment of contrasts within a child's phonology are indeed only more explicit justification for assumptions which may often have been intuitive in clinical practice. It seems worth making such procedures explicit in order to give a little more theoretical backing to such an approach.

Although we are suggesting methods slightly different to those suggested by some linguists (e.g. Haas, 1963, 1968; Fry, 1966, 1968) it must nevertheless be obvious that we are in complete agreement with them on the importance of phonological features and on the notion of contrast and in avoiding any purely haphazard phonetic approach.

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